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LABORATORY REACTIVATION OF DIAPAUSING LARCH CASEBEARER LARVAE FOLLOWING DIFFERENT LENGTHS OF WINTER EXPOSURE

by

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ABSTRACT

Batches of field-collected diapausing larvae were transferred to 20° C between November and April. Before larvae became active, the elapsed time varied depending on date of collection. The number of days until 50 percent of the larvae reactivated decreased from 28 to less than 1 between November and May. This relationship is useful in predicting reactivation of larvae for use in a laboratory rearing program.

Keywords: Larch casebearer, *Coleophora laricella*.

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The larch casebearer, *Coleophora laricella* (Hbn.) (Lepidoptera: Coleophoridae), is the object of a biological control program in the Pacific Northwest where parasites are being reared in the laboratory for study and release in infested larch stands.[1/] The larch casebearer can be reared throughout the year on potted larch seedlings. However, from November through April larvae are more easily obtained from the field by gathering branches on which the cases of the diapausing larvae are firmly attached.

When moved to room temperature, larvae exhibit a period of apparent inactivity, following which they free their cases from the twigs and resume feeding and growth. During this preliminary period of apparent inactivity, internal physiological changes are proceeding. The length of the period is variable depending upon the duration of the chilling period previously experienced. Eidmann,[2/] in extensive experiments in Sweden, recorded reactivation of larvae of *C. laricella* over a wide range of temperatures. I recorded and am reporting here the reactivation of larvae collected in Oregon during the winter of 1972-73 to serve as a basis on which to predict reactivation of casebearer larvae for use in the laboratory rearing program.

MATERIALS AND METHODS

Twigs were cut from November to April from infested western larch (*Larix occidentalis* Nutt.) trees at an elevation of about 1200 m, 35 km northwest of Elgin in the Blue Mountains of Oregon. Twigs were placed in polyethylene bags closed with a rubber band and transported back to the laboratory. Some were stored temporarily at 2° C. In the laboratory, twigs were placed in one of two types of emergence containers to facilitate collection of reactivated larvae: (1) a 35-cm length of 10.2-cm-diameter black plastic pipe closed on each end with a piece of nylon chiffon or (2) a 15.8 by 30.2 by 7.6-cm clear polystyrene box with one of the 15.8 by 30.2-cm sides closed with nylon chiffon. Ambient conditions were maintained at 20±1° C and 68±5 percent relative humidity. Fluorescent lights in the laboratory were controlled by time switches to give a daily regimen of 18 hours light and 6 hours dark.

Emergence containers were inspected every 1-2 days; any larvae which had completed diapause, as evidenced by the freeing of the case from the twig, were removed and counted. Containers were inspected until reactivated larvae ceased to appear. Cases still attached to twigs after this period were not

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1/ R. B. Ryan and R. E. Denton. Initial releases of *Chrysocharis laricinellae* and *Dicladocerus westwoodii* for biological control of the larch casebearer in the Western United States. USDA Forest Service Research Note PNW-200, 4 p. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon. 1973.

2/ H. H. Eidmann. Ökologische und physiologische Studien über die Larchenminiermotte, *Coleophora laricella* Hbn. Studia Forestalia Suecica, Nr. 32, 222 p. 1965.

examined to determine if any larvae still remained in diapause or whether larvae had died.

The daily numbers of reactivated larvae were plotted as a cumulative percentage of the total numbers reactivated. The regression of the number of days until 50 percent were reactivated over the date the batch was transferred to 20° C was calculated to establish the relationship between duration of winter exposure and time for reactivation.

RESULTS AND DISCUSSION

Results are presented in figures 1 and 2. Reactivation in the November 21 collection was delayed and took place over a considerable timespan, the 11th to the 53d day. It was almost a month before the 50-percent point on the reactivation curve was reached. Reactivation in successive batches grew progressively more rapid. For example, the 50-percent point for the April 3 batch was reached within 2 days after transfer to 20° C. When larvae

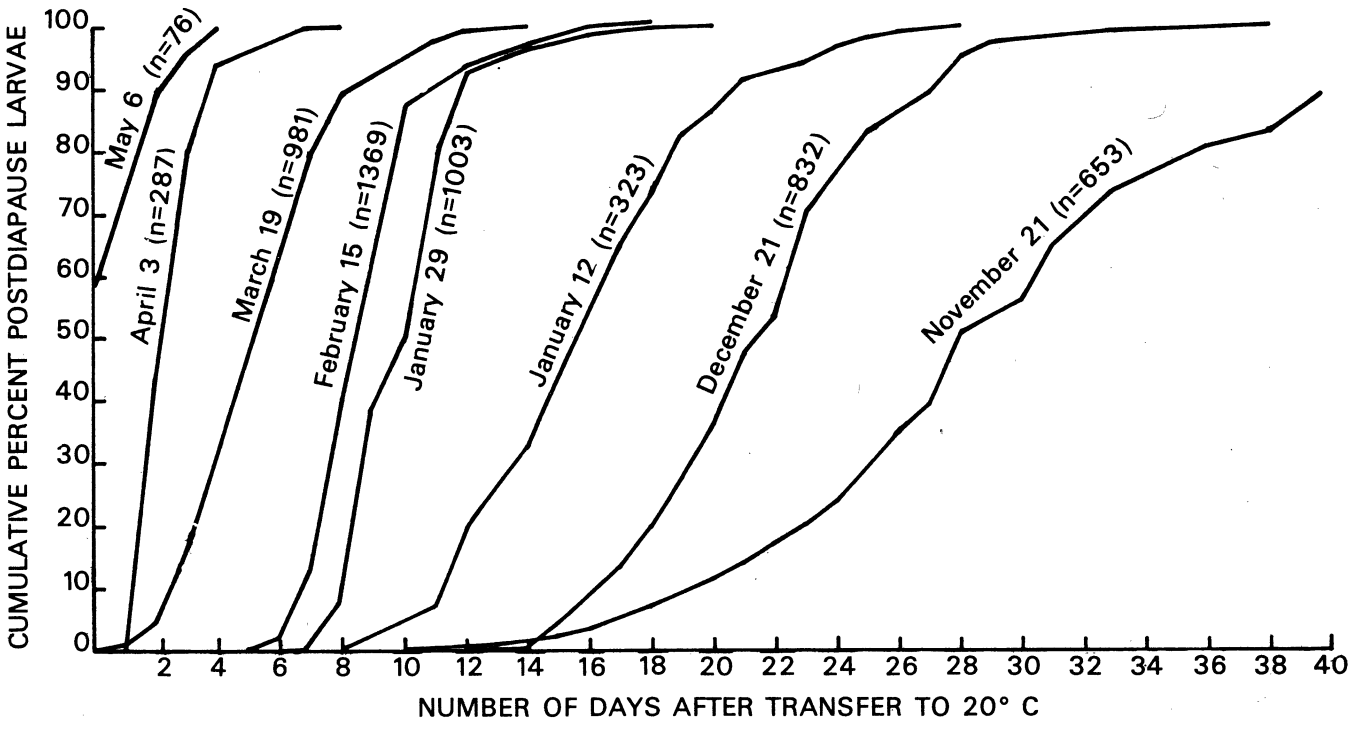

Figure 1.--Reactivation of overwintering *Coleophora laricella* transferred to 20° C on various dates from November 1972 to May 1973.

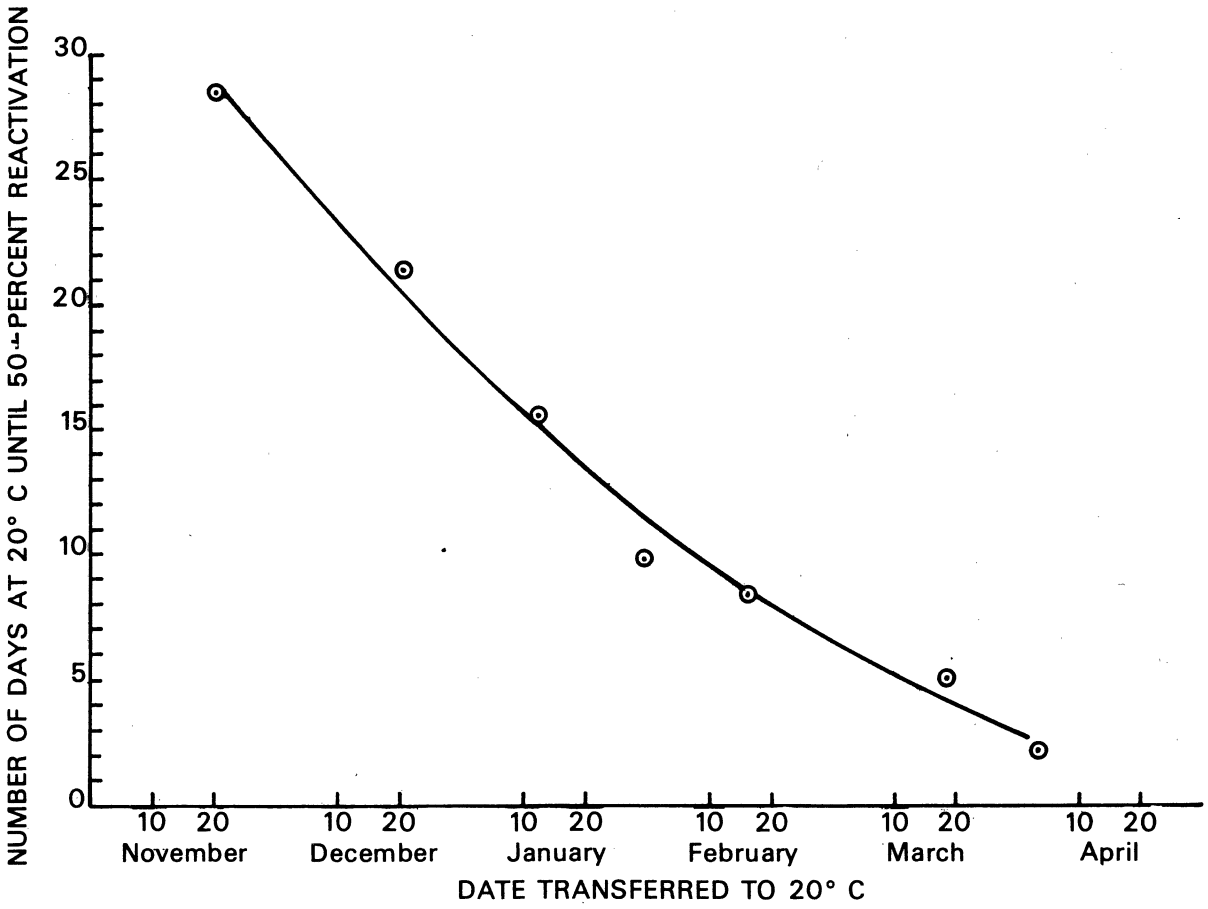

Figure 2.--The relationship between duration of winter exposure and reactivation time at 20° C for overwintering *Coleophora laricella* larvae.

which had been stored at 2° C were transferred to 20° C on May 6, many larvae became active immediately, indicating that diapause had already been terminated.

In the field, active, feeding larvae can be found as early as mid-April at lower elevations, but at higher elevations some larvae do not become active until mid- to late May.

The relationship between reactivation time and date for the period November 21 to April 3 (fig. 2) can be described by the equation:

$$Y = 35.56 - 0.3465X + .00085X^2$$

(where Y = number of days until 50-percent reactivation and X = number of days after November 1) ($r^2 = 0.989$).

A knowledge of this relationship is useful in predicting reactivation of larvae for use in a laboratory rearing program.

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